IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT APPLICATION
LARGE-SCALE WATERCRAFT STORAGE FACILITY

Background of the Invention.

The field of the invention pertains to large-scale warehouse and boat storage facilities and, in particular, to the out-of-water storage of motor yachts.

For storage and repair, motor yachts of about 30 to 80 feet in length are typically hauled from the water in slings suspended from wheeled gantry cranes or in cradles riding on marine railways. Larger yachts require marine railways or dry docks. Smaller yachts utilize trailers towable behind vehicles – usually trucks.

Powerboats and yachts above about 25 feet in length typically are stored outdoors on trailers or cradles. On occasion, they are stored on wooden blocks and supports. Small boats below about 20 feet in length are now often stored in warehouses on racks. The small boats are placed in, or removed from, the racks with forklift trucks ("hi-lo's"). Such trucks are inadequate for larger boats and yachts for a variety of reasons.

Since indoor warehousing of a wide variety of other objects up to and including the size of automobiles has become common, there has been some development of more convenient and safer warehousing for small boats. Illustrative of such warehousing is U.S. Pat. No. 6,007,288 wherein the warehouse is equipped with a traveling overhead crane having a specialized cradle to lift a boat. The boat racks comprise frame assemblies to support rack assemblies having cantilever beams to support the boats. While practical for small boats, such a warehousing system is not practical for large powerboats and yachts.

U.S. Pat. No. 3,786,942 discloses an overhead traveling crane for carrying boats in suspended slings. The suspended slings descend from a first frame that is carried by a second frame in direct suspension from the traveling crane. The first frame is movable horizontally and remains with the stored boat in a rack.

U.S. Pat. Pub. No. 2002/0176767 discloses a rotatable forklift that travels on rails into and out of the storage area to place boats in storage racks. This design allows relatively low warehouses with low doors to be used.

Japanese Pat. Pub. No. 2-183055 and No. 2-241891 disclose a relatively low tower for lifting a boat from the water or a trailer and transferring the tower

and boat to a second lift where the tower and boat are lifted to a storage location in a rack. The boat is supported on a frame that is moved into, or retrieved from, the storage location.

French Pat. Pub. No. 2552411 discloses an overhead traveling crane with a telescopic retrieval device for lifting boats from underneath and depositing them in racks for storage.

While suitable for small watercraft storage, the devices of the prior art are not practical for the storage and retrieval of large power yachts weighing many tons and worth hundreds of thousands, and sometimes millions, of dollars.

Summary of the Invention.

The new warehousing and dry storage system and apparatus are directed to powerboats and yachts from about 30 to 80 feet in length but are not limited to such sizes. The basic units comprise at least one horizontally and vertically movable prime mover and a plurality of wheeled cradles, both of very robust steel construction.

The prime mover has a horizontal railed portion upon which rides a tow frame and one of a plurality of wheeled cradles. The tow frame, in turn, is driven by a cable or chain to a reversible electric gear motor. The prime mover aligns with heavy structural horizontal steel frame members of the warehouse. These steel frame members serve as rails in supporting one or more wheeled cradles. The wheeled cradles are equipped with boat pads for direct supporting contact with a boat hull. Power yachts, each weighing many tons, can easily be supported in racks in a stacked configuration in an enclosed warehouse with the new configuration of the invention.

Brief Description of the Drawings.

FIG. 1 is a cross-section through the new boat storage warehouse building;

FIG. 2 is a partial longitudinal section of the new boat storage warehouse taken perpendicular to the section in FIG. 1;

FIG. 2A is a detail taken in the direction of arrow 2A in FIG. 2;

FIG. 2B is a detail taken in the direction of arrow 2B in FIG. 1;

FIG. 3 is a perspective exploded view of the typical storage frame rails, storage frame, tow frame and prime mover rails.

FIG. 4A is a plan view of a typical boat storage frame;

FIG. 4B is a side elevation of a typical boat storage frame;

FIG. 5A is a plan view of the prime mover;

FIG. 5B is a side elevation of the prime mover;

FIG. 5C is an end elevation of the prime mover;

FIG. 6A is a plan view of the tow frame;

FIG. 6B is a side elevation of the tow frame; and

FIG. 6C is an end elevation of the tow frame.

Description of the Preferred Embodiment.

Illustrated in FIGs. 1 and 2 is a typical building section for the new watercraft, boat or power yacht storage facility. The exterior walls 10 and roof 12 may be fully covered or not, depending on climate and location. The steel frame elements 14 are of robust construction, as is the foundation (not shown) to support the structure and a plurality of very valuable large boats, such as the "cigarette" offshore racing boats 16 shown.

The building has a center aisle 18 extending upwardly to the roof 12. Below the roof is a traveling crane 20 which movably rests on a pair of crane rails 22 which, in turn, extend the length of the aisle 18. Such traveling cranes are commonly used in heavy manufacturing. On the traveling crane 20 are a pair of crane trolleys 24 separated by a spread beam 26 attached to each crane trolley at 28 to provide a fixed distance between the crane trolleys. Steel lifting cables 30 descend from each crane trolley 24 to a prime mover 32 upon which rests a wheeled cradle or storage frame 34 and boat 16. A pair of steel lifting cables 30 descend from each crane trolley 24 to either side of the prime mover 32. Although shown as single cables 30, block and tackle cable sets may be used, as necessary.

Each storage location 36 comprises a volume defined by the frame elements 14 of the building, and the multiple storage locations form a rack configuration of the frame elements. Within a storage location 36 are a pair of steel beams forming storage rails 38 upon which rests a movable storage frame 34. In addition to performing the function of rails, the storage rails 38 form an integral part of the building structure as horizontal steel frame elements in FIG. 1. The ends of the storage rails 38 terminating at the aisle 18, as best shown in FIG. 2, are equipped with horizontal positioners 40 and vertical stops 42 that engage and align

the prime mover 32. As shown in more detail in FIGs. 2A and 2B, the horizontal positioner 40 is in the form of a truncated "V" extending horizontally from the lower flange of the storage rail 38. Directly beneath the horizontal positioner 40 is the vertical stop 42, also adapted to engage the prime mover 32. The shelf beam 44 not only supports the end of the storage rails 38 but also the vertical stop 42 and inboard end of the horizontal positioner 40. The outboard end of the horizontal positioner 40 is supported by the stop 42.

Illustrated in FIGs. 3, 4A and 4B is a storage frame 34 of steel construction and equipped with a plurality of hull supports or boat pads 46. The boat pads 46 are mounted on the storage frame 34 and extend upwardly into supporting contact with a boat hull. The configuration and location of the boat pads 46 is uniquely determined by the shape and structure of the boat to be supported.

The storage frame 34 is generally rectangular, with multiple cross-members 48 for supporting the boat pads 46 and joining together side members 50. Attached to the side members 50 are a plurality of flanged rollers or wheels 52 that movably support the storage frame 34. The wheels 52 may be on axles 54, as shown, or stub axles welded to the side members 50. Extending down the center of the storage frame 34 is a pair of center members 56 in FIG. 3 to distribute the forces imposed upon the storage frame by the tow bar 58. In FIG. 4A, a single center member 56 is shown.

The wheels 52 roll upon the storage rails 38 and onto or off the prime mover rails 60. As also shown, a tow frame 62 equipped with flanged wheels 64 rests upon the prime mover rails 60.

The storage frame 34 shown in FIGs. 4A and 4B is somewhat simpler in construction from that shown in FIG. 3. The axles 54 pass inside tube steel cross-members 66. The tow bar 58 for either version of the storage frame 34 is equipped with an upwardly extending stud or handle 68 for attachment to the tow frame 62. The tow frame 62 is equipped with a double-ended tow bar 70 having a countersunk tow hole 72 at each end for attachment to a storage frame 34 to either side of the aisle 18.

Illustrated in more detail in FIGs. 5A, 5B and 5C, is the prime mover 32 suspended from the cables 30. Transverse beams 74 are welded to the prime mover rails 60 and extend outwardly beyond the rails to side beams 76. The tip ends 78 of two of the transverse beams 74 are connected to the cables 30 on each

side of the prime mover 30. Longitudinally down the center of the prime mover 30 extends an endless cable or chain 80. The cable 80 extends about tail pulleys 82 on axles 84 at each end 86 of the prime mover 30. Centered in the prime mover 30 is a drive assembly 88 for the cable 80 and tow frame 62, which is attached to the cable at 90.

The drive assembly 88 comprises one or more submersible electric motors 92 drivably attached to an axle 94 carrying a drive pulley 96. The drive pulley 96 is located between a pulley 98 on an axle 100, which is fixed in horizontal location, and a pulley 102 on an axle 104, which is horizontally adjustable longitudinally. All three pulleys 96, 98 and 102 engage the cable 80 in a serpentine manner, as shown, with pulley 102 serving as an adjustable cable tensioner. The drive assembly 88 is supported on beams 106 extending between prime mover rails 60.

Illustrated in more detail in FIGs. 6A, 6B and 6C, is the tow frame 62 which rests upon the prime mover rails 60. The tow frame 62 comprises a rectangular frame with longitudinal side members 108 and transverse members 110 welded together. Passing through the frame are axles 112 to support the flanged wheels 64. Welded to the transverse members 110 is the tow bar 70, and extending beneath the tow bar is a dual attachment 90 to the cable 80. The tow hole 72 at each end of the tow bar 70 is countersunk from underneath to more easily fit over a stud or handle 68 on a storage frame 34. Although shown as a stud and hole configuration, the means to connect and disconnect the tow frame 62 from a storage frame 34 can take many other forms, such as a typical railroad car coupler.

Beneath the flanged wheels 64 on the tow frame 62 are undercarriage rollers 114 mounted on axles 116, in turn fastened to the tow frame. The rollers 114 serve to prevent the tow frame 62 from tilting transversely or longitudinally off the prime mover rails 60 when under heavy load.